REMARKS

The application has been reviewed in light of the Office Action dated December 8, 2003. Claims 1-16 are pending. The Office Action states that claims 6-11 are allowed. By this Amendment, Applicants have amended claim 16, to place the claims in better form for examination, without narrowing the scope of the claimed invention. Accordingly, claims 1-5 and 12-16 are presented for reconsideration, with claims 1 and 12 being in independent form.

Claim 16 was rejected under 35 U.S.C. §112, second paragraph, as purportedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16 has been amended hereinabove to clarify the claimed invention.

Accordingly, withdrawal of the rejection of claim 16 is requested.

Claims 12, 15 and 16 were rejected under 35 U.S.C. §103(a) as purportedly unpatentable over U.S. Patent No. 5,484,686 to Maeda et al, in view of European Patent Application No. EP 1 058 249 of Yamada et al. Claims 12-16 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over European Patent Application No. EP 0 475 452 of Yamashita et al. Claims 1-3, 5 and 12-16 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yamashita, further in view of Japanese Patent Application No. JP 01-258222 ("the '222 reference"), Japanese Patent Application No. JP 61-180945 ("the '945 reference") or Japanese Patent Application No. JP 04-032043 to Yura ("the '043 reference"). Claims 1-5 and 12-16 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yamashita, further in view of

either of the '222 reference, the '945 reference or the '043 reference, combined with either Yamada or European Patent Application No. EP 0 867 868 of Ohno et al.

Applicants have carefully considered the Examiner's comments and the cited art, and respectfully submit that independent claims 1 and 12 are patentable over the cited art, for at least the following reasons.

This application relates to phase-change recording media which are provided with improved dielectric protective layers and reflective layers, feasible for implementing record/readout operations at high recording velocities and attaining, amongst other properties, desirable overwrite characteristics and storage durability.

Phase-change recording media are capable of implementing repeated record/readout operations by means of laser beam irradiation utilizing phase transition between amorphous and crystalline states. For example, recorded data bits are formed generally by transforming portions of a recording layer into the amorphous state, while erasure of the recorded bits is carried out by crystallizing the portions. There is generally a demand for improved recording velocity, density and capacity in recording media. In implementing high recording speed while still retaining high density recording, phase-change recording media need the capability of achieving repetitive heating, quenching and annealing operations. However, conventional phase-change recording media experience difficulties obtaining high repeatability in overwrite cycles. In order to achieve the desired high recording speed and high density recording, there is a need to improve the materials for forming, and the

construction of, recording media.

Through extensive research and experimentation, Applicants found, as disclosed in this application, appropriate recording materials and materials for dielectric protective layers formed contiguously to a recording layer for a phase-change recording medium which can be used even when the less expensive Ag metal is used as a major ingredient for forming a reflective layer, while achieving satisfactory recording media capabilities such as recording at high linear velocities, improved recording operation cycles, storage durability and overall reliability.

For example, independent claim 12 is directed to a phase-change optical recording medium which comprises a reflective/heat dissipating layer provided contiguously to at least one surface of a recording layer, having a dielectric protective layer interposed between the reflective/heat dissipating layer and the recording layer. In particular, the recording layer essentially consists of a phase-change recording material having a Sb_3Te meta-stable phase, the dielectric protective layer essentially consists of a dielectric material containing ZrO_2 as a major ingredient, and the reflective/heat dissipating layer essentially consists of Ag, as a major ingredient. As disclosed in the application at, for example, page 11, there are attendant advantages to use of a phase-change recording material having a Sb_3Te meta-stable phase for forming the recording layer.

Independent claim 1 is directed to a phase-change optical recording medium capable of carrying out record/readout/erase operations of information data through the reversible phase

transition between amorphous and crystalline states induced by light beam irradiation in a recording layer included in the recording medium. The phase-change optical recording medium comprises a transparent substrate on which the light beam is incident, and contiguous layers formed on the substrate in order as follows, a lower dielectric protective layer, the recording layer, an upper dielectric protective layer, and a reflective/heat dissipating layer. The upper dielectric protective layer essentially consists of a mixture of ZrO_2 and SiO_2, having a composition of $(ZrO_2)_{100-x}$ $(SiO_2)_x$, where $0 < x < 60$ (mole %).

Maeda, as understood by Applicants, is directed to incompletely erased signals on a phase-change optical recording medium. According to Maeda, the problem can be alleviated by acquiring larger reflectivity in the recorded state of an optical recording medium or in an amorphous state of a recording film constituting the optical recording medium than in the erased state of the optical recording medium or in a crystalline state of the recording film constituting the optical recording medium. The Office Action cites Figures 73(a) and 74(a) and column 19, lines 15-48 of Maeda as disclosing use of a gold reflective layer.

Yamada is directed to a phase-change optical recording medium which comprises a supporting substrate and, as continuous layers formed on the supporting substrate in the order listed, a first dielectric layer, a recording layer, a second dielectric layer, a metal/alloy layer and an ultraviolet light curing resinous layer. According to the Office Action, Yamada discloses dielectric layers and reflective layers of

various constitution.

Yamashita, as understood by Applicants, is directed to use of a quasi-amorphous zirconia dielectric layer for optical or magneto-optical data storage media. The Office Action states that Yamada discloses use of assorted phase change materials in the recording layer and assorted metals in the reflective layer.

The '222 reference, as understood by Applicants, is directed to the problem of wear and flaw of a magnetic recording medium layer. The Office Action states that the '222 reference teaches the addition of various oxides to zirconia in amounts of a few mole %.

The '945 reference, as understood by Applicants, is directed to use of a complex oxide in a protective layer provided on both sides of a recording layer. The Office Action states that the '945 reference teaches optical recording media with silica, zirconia and niobium oxide protective layers.

The '043 reference, as understood by Applicants, is directed to moisture proofing an optical information recording medium by laminating a protective film (of a specific composition) on the specular surface side of a resin substrate and laminating a recording layer on the other surface. According to the Office Action, the '043 reference teaches use of mixed zirconia, silica dioxide protective layers in magneto-optical recording media.

Ohno, as understood by Applicants, is directed to an optical information recording medium for recording, reproducing and erasing mark length-modulated amorphous marks. The Office Action states that Ohno discloses use of recording layers having a specified formula (as shown in Ohno at page 5, lines 3-54), including additives which purportedly have the benefits of stabilization and high speed

crystallization.

Applicants do not find disclosure or suggestion by the cited art, however, of a phase-change optical recording medium wherein (i) the recording layer essentially consists of a phase-change recording material having a Sb_3Te meta-stable phase, (ii) the dielectric protective layer essentially consists of a dielectric material containing ZrO_2 as a major ingredient, and (iii) the reflective/heat dissipating layer essentially consists of Ag, as a major ingredient, as provided by independent claim 12. The cited art simply does not disclose, suggest or otherwise motivation for a phase-change optical recording medium having the combination of features (i)-(iii), in order to obtain satisfactory recording media capabilities such as recording at high linear velocities, improved recording operation cycles, storage durability and overall reliability.

Similarly, Applicants no teaching or suggestion in the cited art, however, of a phase-change optical recording medium capable of carrying out record/readout/erase operations of information data through the reversible phase transition between amorphous and crystalline states induced by light beam irradiation in a recording layer included in the recording medium, wherein the upper dielectric protective layer essentially consists of a mixture of ZrO_2 and SiO_2, having a composition of $(ZrO_2)_{100-x}$ $(SiO_2)_x$, where $0 < x < 60$ (mole %), as provided by independent claim 1.

While the Office Action contends that the '222 reference, the '945 reference and the '043 reference teaches use of zirconium or zirconium oxide protective films or layers in assorted recording media,

none of the cited art discloses, suggests or otherwise provides motivation for adapting a phase-change optical recording medium to have an upper dielectric protective layer essentially consists of a mixture of ZrO_2 and SiO_2, having a composition of $(ZrO_2)_{100-x}$ $(SiO_2)_x$, where $0 < x < 60$ (mole %).

Since the cited art does not disclose or suggest each and every feature of the claimed invention, the cited art does not render the claimed invention unpatentable.

Accordingly, for at least the above-stated reasons, Applicants respectfully submit that independent claims 1 and 12, and the claims depending therefrom, are allowable.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition, and the Commissioner is authorized to charge the requisite fees to our Deposit Account No. 03-3125.

The Office is hereby authorized to charge any additional fees that may be required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Allowance of this application is respectfully requested.

Respectfully submitted,

Paul Teng, Reg. No. 40,837
Attorney for Applicants
Cooper & Dunham LLP
Tel.: (212) 278-0400